

Amendments to the Specification

Please replace the paragraph beginning on page 6, line 22 with the following amended paragraph:

Figure 1b illustrates an example embodiment of an electronic model of a dental impression used to demonstrate articulation of a jaw and corresponding teeth according to one possible embodiment of the present invention. In this example embodiment 110, the electronic models for the upper jaw 101 and the lower jaw 102 are super imposed upon an x-ray of the patient's skull ~~102~~ 120 to allow the two electronic models to be moved relative to each other about a point of rotation for the jaw 121 in a manner that is consistent with the actual geometry of a patient as shown in the x-ray 120. This movement and interaction of the upper jaw 101 and the lower jaw 102 also require the use of a common coordinate system for the electronic models for the upper jaw 101 and the lower jaw 102. Additional details regarding the use of electronic models in the simulation of teeth and jaw movement relative to each other may be found within US Provisional Patent Application entitled, "METHOD AND APPARATUS FOR ELECTRONICALLY SIMULATING JAW FUNCTION", Serial No. 60/376,111, filed April 29, 2002, now US Patent Application entitled, "METHOD AND APPARATUS FOR ELECTRONICALLY SIMULATING JAW FUNCTION", Serial No. 10/426,253, filed April 29, 2003, both of which are incorporated herein in their respective entireties.

Please replace the paragraph beginning on page 7, line 8 with the following amended paragraph:

Figure 2 illustrates another example embodiment of an electronic model for an upper and lower jaw impression electronically interacting with each other according to one possible embodiment of the present invention. In this embodiment 200, the upper jaw 101 and the lower jaw 102 are shown in a position that corresponds to the position in which the two physical models may be scanned together. In this embodiment 200, the two models are shown with a flat surface of the base elements in which the impressions for the teeth are mounted. The two flat surfaces ~~is~~ are typically shown in a co-planar arrangement with some physical separation for the two models. While the side surfaces of the base elements contain a few co-planar surfaces that allow the registration of the models in various dimensions, the vertical Z-axis for the two models is not ~~radially~~ radially detectable. As such, additional steps must be taken to translate the positions in the two electronic models into a single coordinate system. These operations must occur before the two models 101-102 may be manipulated as opposing teeth and jaws.

Please replace the paragraph beginning on page 8, line 26 with the following amended paragraph:

The mass memory also stores program code and data for providing a software development and neural network analysis and training system. More specifically, the mass memory stores applications including common coordinate system application program 330, programs ~~334~~ 343, and similar data processing applications 336. Common coordinate system application program 330 includes computer executable instructions which, when executed by computer 301 to perform the logic desired herein.

Please replace the paragraph beginning on page 12, line 3 with the following amended paragraph:

Figure 6 illustrates a spatial transformation for a point located on an upper electronic model ~~form~~ from its own coordinate system to a single coordinate system. A point $[[P]] \underline{P}_i$ 601 on the electronic model for the upper jaw 101 is defined in terms of a common coordinate system having $[[a]]$ an origin O. The point $[[P]] \underline{P}_i$ 601 is defined as having a position in this common coordinate system $[[P]] \underline{P}_i = (X_i, Y_i, Z_i)$.

Please replace the paragraph beginning on page 12, line 8 with the following amended paragraph:

In order to define the values that comprise $[[P]] \underline{P}_i$, one needs to combine the values of vector V_j 612 with vector V_k 611. ~~V_j 612 - V_k 611~~ is defined in terms of the coordinate system used when the electronic model for the upper jaw was scanned. This vector is known since both the point $[[P]] \underline{P}_i$ 601 is known in the coordinate system used when the electronic model for the upper jaw was scanned and the point P_j 602 is known as the top point on the sphere 521 in the same coordinate system. This point is known as a fixed point in the coordinate system when the alignment spheres are engaged with the alignment channels.

Please replace the paragraph beginning on page 12, line 16 with the following amended paragraph:

Vector ~~V_k 611 - V_j 612~~ is the value for the location of this top point on sphere 521 when the combined apparatus is scanned after the two physical models are moved into the desired

position. These two vectors, when added together for each location on the upper electronic model 101, transforms all of the coordinates from the two separate coordinate systems into a single coordinate system.

Please replace the paragraph beginning on page 12, line 21 with the following amended paragraph:

Figure 7 illustrates an exploded view for the upper and lower jaw dental impression physical model scanning plate apparatus according to an example embodiment of the present invention. The exploded view includes the scanning base plate module 401 corresponding to the electronic model generated for the lower jaw model 102; the physical model plate module 402 including its three alignment spheres 421-423, and the physical module corresponding to the lower jaw 102. The exploded view of Figure 7 also includes the physical model corresponding to the upper jaw 101 and the physical model plate module ~~502~~501 including its three alignment spheres [[421]] ~~521 - 523~~ [[423]] used to generate the electronic model for the upper jaw 101. These components work together as discussed above to generate a composite electronic model for the upper and low jaw of a patient within a common coordinate system.

Please replace the paragraph beginning on page 13, line 17 with the following amended paragraph:

The physical model scanning module 811 interacts with a laser scanning device to obtain a set of position data points obtained from the scanning of a physical model. This processing ~~module system~~ 801 performs all of the processing necessary to reduce this data of location points to an electronic model defined in a polygonal mesh. These electronic models generated by this processing module 801 may be stored within the electronic model database 802 for later use. These electronic models may also be passed to the physical model reference point determination module 812, for further processing.

Please replace the paragraph beginning on page 14, line 12 with the following amended paragraph:

Figure 9 illustrates an example operation flow for a system for generating an electronic model for a dental impression having a common coordinate system according to one possible embodiment of the present invention. The process begins 901 and proceeds to operation 911 in

which the various physical models are mounted on the scanning apparatus that is part of a scanning device. In completing this operation 911, the physical models are located within the coordinate system of the scanning device for scanning. Next, operation 912 scans the physical models and then ~~generated-generates~~ the electronic models corresponding to the various physical models. These electronic models are expressed as a polygonal mesh that corresponds to the outside surface of the physical objects.

Please replace the paragraph beginning on page 14, line 22 with the following amended paragraph:

Operation 913 then positions the various physical models into desired positions in which the physical models interact with each other in the same way that the corresponding physical objects interact with each other as they do in the physical work. In the dental model processing, the upper and lower physical models are ~~positions positioned~~ into a position that represents the relationship of the upper and lower jaw of a patient. This positioning may occur in different ways as discussed above with reference to Figure 6 without deviating from the spirit and scope of the present invention as recited in the attached claims.